
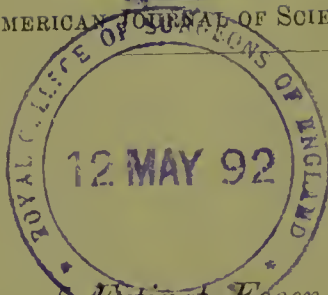


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A New Order of ~~Extinct~~ Eocene Mammals (*Mesodactyla*);
by O. C. MARSH.

DURING explorations in the lower Eocene deposits of New Mexico, carried on by the writer in 1876–1880, some of the first fossils discovered were remains of small mammals about as large as a fox, and of much scientific interest. The teeth are somewhat similar to those of Ungulates, but the rest of the skeleton, and especially the limbs and feet, are of a generalized type quite distinct from any of hoofed animals known, recent or extinct. Some parts of the structure seem to indicate an affinity with *Hyrax*, but the limbs and feet show characters resembling those of the Primates, especially the extinct forms, and likewise seen in Insectivores, and even in some of the Rodents. A large collection of these remains was secured, and when examined was found to include several distinct forms, all of small size, and forming together a natural group.

One of these forms was described by Cope, under the name *Meniscotherium chamense*, the type being a portion of an upper jaw, with the molars in place.* This specimen was subsequently described and figured by that author, who regarded it as belonging to the *Perissodactyles*.† Later, he defined two additional species, and proposed for the family the name *Meniscotheriidae*; and more recently has described and figured various parts of the skull and skeleton.‡

Several other authors since then have discussed the affinities of this peculiar family, but mainly without presenting any new facts bearing on the question, the general opinion being that these animals are primitive forms of *Perissodactyla*, more or less related to *Chalicotherium*, Kaup, which genus they resemble in dentition. A comparison of the feet would have been more important, but those of *Meniscotherium*, at least, were unknown.

* Report of Chief of Engineers for 1874, pt. ii, p. 596.

† Extinct Vertebrata, p. 251, pl. lxvi, 1877.

‡ Tertiary Vertebrata, 1884.

The large collection of the remains of this group secured by the writer contains almost every part of the skull and skeleton, pertaining to many individuals. Among these are specimens which agree closely with the types described and figured by Cope, as well as a number of others that are evidently quite distinct. Besides *Meniscotherium*, a second genus is represented, which may be called *Hyracops*, and its typical species is described below. This genus is more specialized than *Meniscotherium*, and may be from a somewhat higher horizon of the lower Eocene, but the two genera are found in the same region, and may perhaps occur together.

An investigation of all the specimens represented in this collection of the writer makes it evident that they pertain not merely to a distinct family, but to a separate order, which may be called the *Mesodactyla*. The skull and teeth resemble strongly those of the *Ungulata*, especially some of the early Perissodactyles, but the limbs and feet prove these fossils to be quite distinct from any hoofed animals hitherto known.

The skull of *Hyracops*, in its general form, resembles that of *Didelphys*. The premaxillaries do not reach the frontals. The latter are wide between the orbits, and there is a small postorbital process, behind which the skull is much constricted. There is a strong sagittal crest. The malar reaches the lachrymal. The palate is complete, and the posterior nares extend forward to the penultimate molar. The brain was of moderate size, with the olfactory lobes and the cerebellum especially developed, and not at all covered by the cerebral lobes.

The dentition of the *Mesodactyla* is of special interest. The teeth are brachydont, the molar series lophodont, with external and internal crescents and intermediate cusps, with deep valleys. In one genus, with which the type specimen of *Meniscotherium* best accords, the premolars are unlike the molars. In the genus *Hyracops*, the last premolar is nearly or quite like the molars.

A striking feature in the dentition of both genera is the succession of the teeth. The first series of incisors, canines, and premolars, appears to be retained for a long period. This is certainly the case with the premolars, which continue in use until long after the three true molars have come into service. This fact confirms the recent researches of Kükenthal on *Didelphys*, and indicates that the supposed true molars may belong to the first dentition.

The vertebræ have their articular faces nearly or quite flat, and in the cervical region, these are oblique. The sacral vertebræ are firmly coössified, and are three in number in *Meniscotherium*, while in *Hyracops* there are four. The sternal bones are flat.

The fore limbs were somewhat shorter than those behind. The humerus is stout, of moderate length, with its distal end much flattened, and a supracondylar foramen. It resembles the humerus of a carnivore rather than that of an ungulate. The radius and ulna are nearly equal in size. The head of the radius is expanded transversely, and closely applied to the ulna, indicating but little rotation. The ulna is a stout bone, with the distal end compressed and pointed. The carpal bones resemble in general form and position those of *Hyrax*, and a central bone is present in the same place as in that genus. The five metacarpal bones are all well developed, and their position with reference to the carpals that support them is shown in the fore foot of *Hyracops* represented below in figure 1.

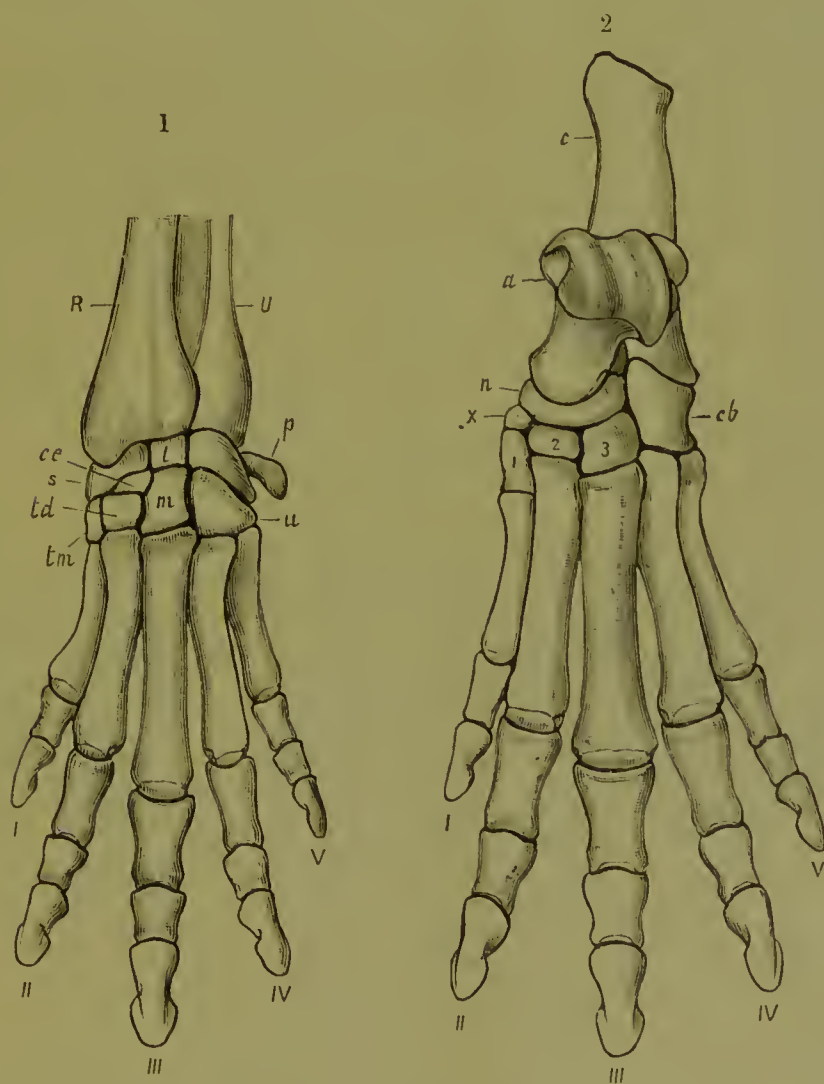


FIGURE 1.—Left fore foot of *Hyracops socialis*, Marsh.

FIGURE 2.—Left hind foot of same species. Both natural size.

a, astragalus; *c*, calcaneum; *cb*, cuboid; *ce*, central bone; *l*, lunar; *m*, magnum; *n*, navicular; *p*, pisiform; *R*, radius; *s*, scaphoid; *td*, trapezoid; *tm*, trapezium; *U*, ulna; *u*, unciform; *x*, epicuneiform.

The feet are primitive in type, and were apparently digitigrade, yet the terminal phalanges were not encased in hoofs or in claws, but possessed an intermediate character, which has suggested the ordinal name. Their extremities are thin, somewhat expanded, and more like those of Primates than of any other group. They were apparently covered by thin nails.

The femur has a third trochanter, near the middle of the shaft. The tibia resembles that of a carnivore. The fibula is complete, well developed, and at its distal end is expanded, and meets both the astragalus and the calcaneum.

The hind foot is represented in figure 2, and presents several points of interest. The astragalus and calcaneum are very similar to those in Rodents. The navicular is supported entirely by the astragalus, and the cuboid by the calcaneum. On the tibial side below the navicular, and supported by it, is a small bone (*x*) having beneath it the entocuneiform. It meets the middle cuneiform also. This bone has apparently not been known hitherto, and may be called the epicuneiform. It may, perhaps, correspond to what is known as the tibial sesamoid in Rodents and Carnivores, but its position and connection in the present tarsus are quite different. Moreover, a distinct tibial sesamoid is also present inside and behind the epicuneiform, and hence not shown in the figure.

In the feet of *Meniscotherium*, there are five well-developed digits in manus and pes. The structure of the carpus and tarsus agrees in general with that of *Hyracops*, but in some points, there appear to be differences of importance.

The order *Mesodactyla* contains at present the two genera *Meniscotherium* and *Hyracops*, which include primitive mammals of small size, having the full number of forty-four teeth in continuous series, with the premolars and molars similar in type to mammals known as Ungulates. The limbs and feet are primitive in type, unlike those of any known Ungulates, and resemble those of Carnivores, or the early Primates.

This order stands in somewhat the same relation to the typical Ungulates that the *Tillodontia* do to Rodents, and the *Chalicotheria** to Edentates. Very briefly defined, the *Mesodactyla* may be considered as having the ungulate type of dentition, with the limbs and feet of early Primates; the *Chalicotheria* as combining an ungulate dentition with the feet of Edentates; while the *Tillodontia* unite with the rodent dentition the extremities of primitive Carnivores. These three orders are quite distinct from each other and from the remain-

* The name first proposed for this order, *Chalicotheroidea*, Gill, 1872, may appropriately be shortened to *Chalicotheria*. The term *Ancylopoda* more recently given is preoccupied. The genus *Moropus* is not identical with *Chalicotherium* as has been stated, and *Morotherium*, which has also been referred to the latter genus, is a true Edentate allied to *Mylodon*.